COURSE SPECIFICATION DOCUMENT

Academic School/Department: Richmond Business School

Programme: Mathematics Minor

***FHEQ* Level:** 5

Course Title: Game Theory and Decision Methods

Course Code: MTH 5130

Student Engagement Hours: 120 (standard 3- credit BA course)
Lectures: 30
Seminar / Tutorials: 15
Independent / Guided Learning: 75

Semester: Fall/Spring

Credits: 12 UK CATS credits
6 ECTS credits
3 US credits

Course Description:
This course provides an introduction to game theory and covers the core principles of game theory and its role in the process of strategic decision-making methods in business, economics and finance. The use of game algebra and the analyses of the structure of various types of practical decision problems as applied to business environments will be emphasized. The areas to be studied will include strategic decision making under uncertainty for both non-probabilistic and probabilistic scenarios, risk analysis, Bayes' Theorem, decision trees, systems of linear equations and basic matrix methods, linear programming, Markov Processes, game strategies, game trees, the Nash equilibrium, and classification of games as sequential-move games and simultaneous-move games to include mixed strategy games, the prisoner's dilemma, zero-sum and two-persons games. Detailed applications to specific strategic situation such as in bargaining, bidding and market competition will be explored.

Prerequisites: MTH 4110 or MTH 4120

Aims and Objectives:

This Course aims to provide students with an understanding of the issues concerned with applying approaches of decision methods and game theory to different strategies employed decision making in business and social science. The course aims to encourage students to develop interest in the subject and pursue other courses that require skills in decision methods and game theory.

Programme Outcomes:

Economics:
A2, A5, B3, D

BA (Hons) Business Management
BA (Hons) Fashion Management and Marketing
BA (Hons) Digital Marketing:
B4, C1, C2, D1, D2

Finance and Investment:
A2, A5, D5

A detailed list of the programme outcomes is found in the Programme Specification. This is maintained by Registry and located at: http://www.richmond.ac.uk/programme-and-course-specifications/

Learning Outcomes

Upon completion of this course, a successful student should be able to

- Understand the main ingredients of what constitutes game theory and differentiate different types of games that are appropriate for different situations.
- Identify game theory as a generalization of decision methods, and to think critically about potential applications of game theory to decision problems in business and social science.
- Be able to apply linear programming, Baye's Theorem, Markov Processes and Game Theory in analyzing decision problem and arriving at the optimal decision strategy and to explore and use data to make decisions using linear programming and simplex methods.
- Be able to select appropriate game theory methods such as Nash equilibrium, repeated games, evolutionary games and their applications in different scenarios such as in markets and competition, bidding strategy and auctions, bargaining and negotiations.

Indicative Content:

Systems of Linear Equations and Matrix Methods.

Analytical and Graphical Linear programming.

Statistical decision theory, decision making under uncertainty and Baye's strategies. Use of sample data in decision making using prior and posterior probability distributions.

Markov process and related states and fundamental matrix.

Basic ideas of games theory, strategic games and how to think about strategic games. Characteristics of two-person zero-sum game, the game matrix, mixed strategies and graphical solution of 2xn games.

The Nash Equilibrium and its applications.

Repeated and evolutionary games and the principles and applications of the prisoners dilemma, collective-action games, the hawk-dove games, cooperative games, bidding strategy and bargaining and applications to markets and competition.

Assessment:
This course conforms to the University Assessment Norms approved at Academic Board and are located at https://www.richmond.ac.uk/university-policies.

Teaching Methodology:
The Course will consist of interactive learning sessions of material presented using PowerPoint slides, small group discussions, and individual projects.

Bibliography:

IndicativeText(s):
Avinash Dixit, Susan Skeath and David McAdams, "*Games of Strategy*", 5th Edition, W.W. Norton & Company, 2020.
Anderson, D.R., Sweeney, D.J., Williams, T.A. and Martin, K. "*An Introduction to Management Science: Quantitative Approaches to Decision Making*", 15th Edition., CENGAGE, 2017.
Avinash Dixit and Barry J. J. Nalebuff, "*The Art of Strategy: A Game Theoretic Guide to Success in Business and Life*", W.W. Norton & Company, 2015.
Fiona Carmichael, "*A Guide to Game Theory*", Financial Times Prentice Hall, 2005.

Journals
International Journal of Game Theory
Journal of Game Theory

Web Sites
Game Theory Society
http://www.gametheorysociety.org/journals/IJGT.html

Please Note: The core and the reference texts will be reviewed at the time of designing the semester syllabus

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Change Log for this CSD:

Major or Minor Change ?	Nature of Change	Date Approved & Approval Body (School or AB)	Change Actioned by Academic Registry
Minor	Updated List of Programme Outcomes	11.11.2016	
Minor	Updated Reading List	October 19	